Volume 33 June, 1947 *Number 6*

Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

Crawler Track
Lubrication
and Maintenance

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LUBRICATION

A TECHNICAL PUBLICATION DEVOTED TO THE SELECTION AND USE OF LUBRICANTS

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Crawler Track Lubrication and Maintenance

THE CRAWLER TRACK principal came into being some forty years ago as an expedient to prevent the conventional wheels of the then popular steam tractor from sinking so deeply into marshy farm land as to become inoperative. The idea involved a machine which would move on tracks which it laid down for itself. On this fundamental idea the modern crawler type of tractor evolved to revolutionize mechanized farming, to speed up earth moving — to build airports on coral islands — even to carry the 'dozer to war as a combat machine.

The track roller is the focal point of a machine equipped with a crawler track. Regardless of how efficient the engine may be, if the track roller mechanism fails the machine stops, or else wears the track roller pins so severely as to require replacement. No wonder the builders, the users, the lubrication engineers thought of lubrication as the cure and today regard track roller lubrication as probably the most important feature in their maintenance schedules.

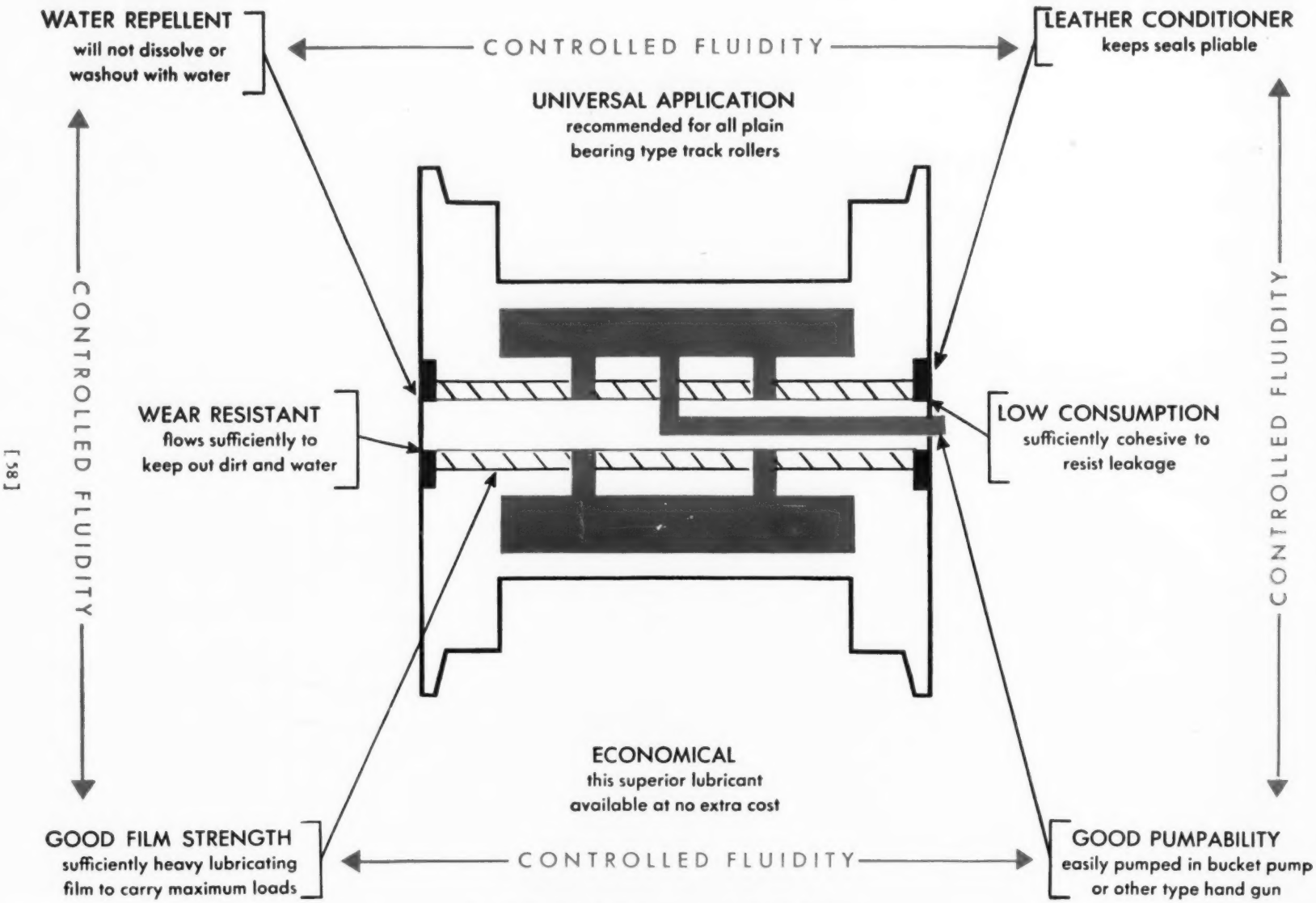
TRACK rollers are separated from the ground only by the track itself. Due to their location, they have to work in mud, sand, water, ice and snow, and at the same time, carry the load of the entire machine for many years. This combination of load and wet abrasive operating conditions has presented a lubrication problem which has only recently been satisfactorily solved by the development of specially prepared track roll lubricants.

The crawler mechanism consists of a sprocket-driven endless-chain formed by short sections of metal plates or track shoes hinged together. On the back of each track shoe are two short parallel rails which combine to form a track which runs on small wheels called variously; track wheels, truck wheels, track rollers, crawler rollers, bogie wheels, etc. These are carried on plain sleeve type bearings or roller bearings.

LUBRICATION OF THE PLAIN BEARING TYPE

The plain bearing track roller is an exceptionally well designed mechanism. It has to be to survive long under the severe conditions to which it is subjected. Its method of lubrication is simple, befitting its rugged construction. The lubricant is applied under air pressure from a 6/1 or a 10/1 ratio air pump or through a hand operated volume compressor. The lubricant is forced through a button-head grease fitting located at the end of the roller. The button-head fitting is a spring loaded valve which opens wide for volume flow of lubricant when pressure is applied. From the drilled shaft, the lubricant is forced into a reservoir or cavity in the track roller bearing. From the reservoir, the lubricant flows through short passages to plain bronze bearings. Leather, composition or metal faced seals at each end of the shaft prevent leakage of the lubricant and keep out dirt.

Even though some very ingenious and effective types of seals are used, some foreign matter tends to work into the bearings especially if operating in fine sand and water when rollers are worn or

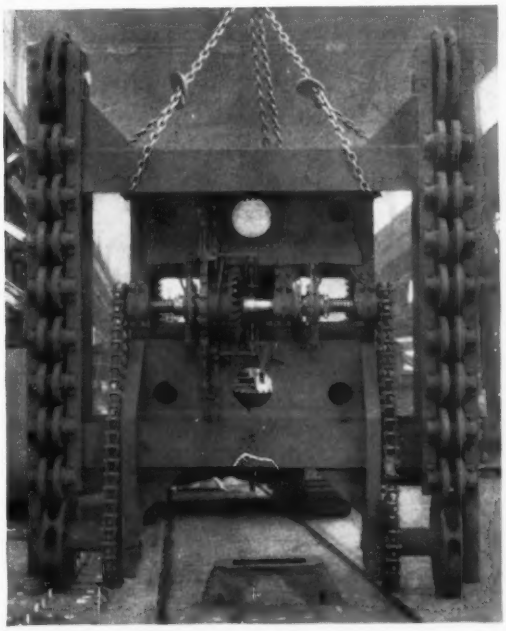

WATER REPELLENT
will not dissolve or washout with water
CONTROLLED FLUIDITY
LEATHER CONDITIONER
keeps seals pliable
UNIVERSAL APPLICATION
recommended for all plain bearing type track rollers
CONTROLLED FLUIDITY
WEAR RESISTANT
flows sufficiently to keep out dirt and water
LOW CONSUMPTION
sufficiently cohesive to resist leakage
CONTROLLED FLUIDITY
ECONOMICAL
this superior lubricant available at no extra cost
GOOD FILM STRENGTH
sufficiently heavy lubricating film to carry maximum loads
CONTROLLED FLUIDITY
GOOD PUMPABILITY
easily pumped in bucket pump or other type hand gun

Track Roller Lubricant — salient features.

if seals are hardened or damaged. To counteract this tendency of dirt and water to work into the bearing, it is desirable to allow a seepage of lubricant.

The Lubrication Must Be Right

The problem has been to provide a water resistant lubricant which will be sufficiently fluid to flow through the lubricating passages keeping seals in good condition and counteracting the entrance of dirt and water, but not too fluid to leak excessively and allow the rollers to run dry between greasings.



Courtesy of Link-Belt Speeder Corporation

Figure 1 — Underneath view of the Link-Belt Speeder crawler mechanism with crawler treads removed.

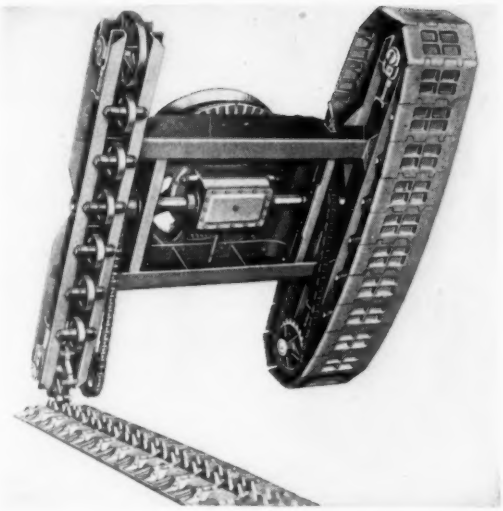
Oil is satisfactory for new rollers, but is apt to leak excessively from worn rollers especially on a hot day.

Grease, on the other hand, on a cool day may not flow sufficiently to keep out dirt and water so it may fail to keep the seals in good condition. Ordinary grease also is difficult to handle in the pumping equipment which is used for applying lubricant to the track rollers.

Buttery, semi-fluid chassis lubricants are a poor compromise. They tend to leak too much from worn rollers on warm days and are not sufficiently fluid on new rollers in cold weather.

The Necessary Characteristics

Fluidity — The answer to this part of the lubricant problem is a stringy, tacky semi-fluid lubricant. This combination of characteristics in a lubricant is

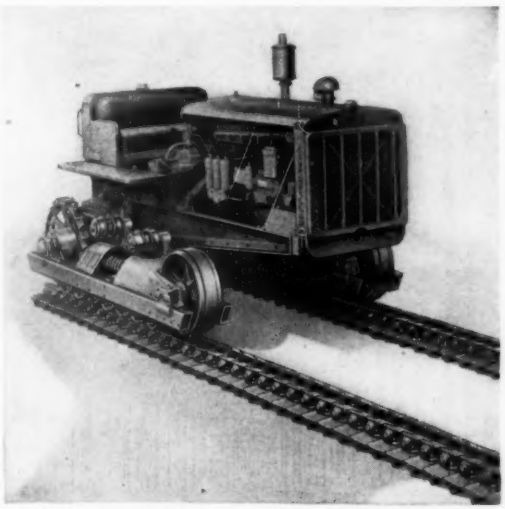


Courtesy of The Thew Shovel Company

Figure 2 — External view of a Thew crawler mechanism.

not easy to attain. The lubricant should contain special ingredients that provide the desired combination of properties, i.e., ability to flow properly where clearances are small and yet not leak excessively from worn rollers due to an internal cohesiveness which will cause it to collect outside the seal and give added protection against the entrance of dust and water.

Water-repellence — A water-resistant lubricant provides most satisfactory lubrication under wet conditions by preventing the entrance of water which can cause rust and impairment of lubrication.



Courtesy of Caterpillar Tractor Co.

Figure 3 — The "Caterpillar" tractor with track removed.

Pumpability — The lubricant must be easily pumped by the volume compressor which is usually used for the application of lubricant to track rollers.

Economy — A thoroughly satisfactory lubricant is required for an application such as this even though some leakage is desired and a considerable quantity of lubricant may be required to service a fleet. No product is cheap regardless of price under these conditions, if through its use the wear and replacement of parts is not kept to an economical minimum.

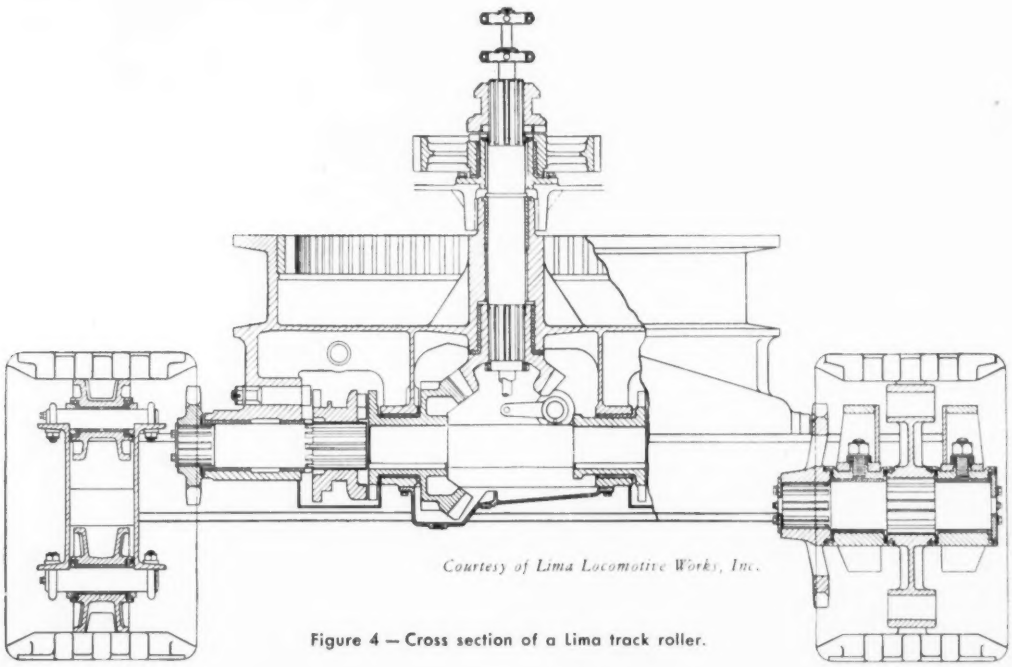


Figure 4 — Cross section of a Lima track roller.

The Grades

A modern track roll lubricant should be available in seasonal grades—Light, Medium and Heavy. The medium grade should be suited for normal atmosphere temperatures: 32-90°, the heavy grade for temperatures above 90°, and the light grade for temperatures below 32°.

Uses

Track roll lubricants are recommended for all track rollers fitted with plain bearings. Where a track roll lubricant is of such nature that it can be used in all types of track rollers (except those running on roller bearings), the lubrication of machines on large construction projects is expedited where a variety of equipment is in service. A good track roll lubricant can be used in all plain track rollers, and is also well suited for all parts of the crawler mechanism requiring lubrication, including the front idler bearings and the outer sprocket shaft bearings. Such a lubricant is also widely used as a general purpose lubricant in cold weather for all plain bearings not subjected to external heat. No lubricant should ever be applied to the track shoe pins. The original stiffness in new tracks will soon disappear in service.

Frequency of Lubrication

Manufacturers recommend that plain bearing track rollers be lubricated at intervals ranging from 2 to 120 operating hours, depending on type of lubricant, design of roller, condition of seals, nature of terrain and atmospheric temperature. When operating in water, the interval should be four hours or less. Shovels, draglines, cranes, etc., should be lubricated every two hours when traveling. However, most contractors prefer to lubricate each roller with the grease gun at least once each shift, since the men responsible for lubrication cannot always know the extent to which each roller is worn, the condition of the seals or what type of ground condition has been, or will be encountered. This can be done rather quickly when the machine is being fueled and other daily maintenance items checked.

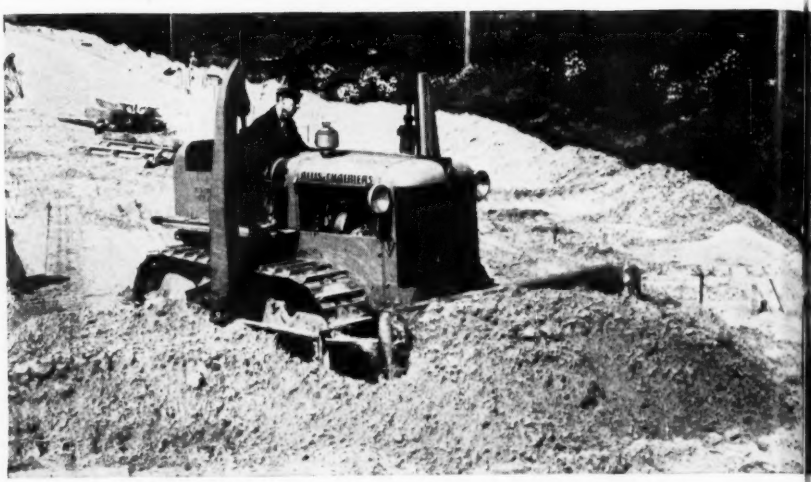
Application of Lubricant

To lubricate plain bearing track rollers the button head or other type grease fitting should be thoroughly cleaned with a stiff brush. Better still, one of the special pocket tools which are available

Courtesy of Caterpillar Tractor Co.

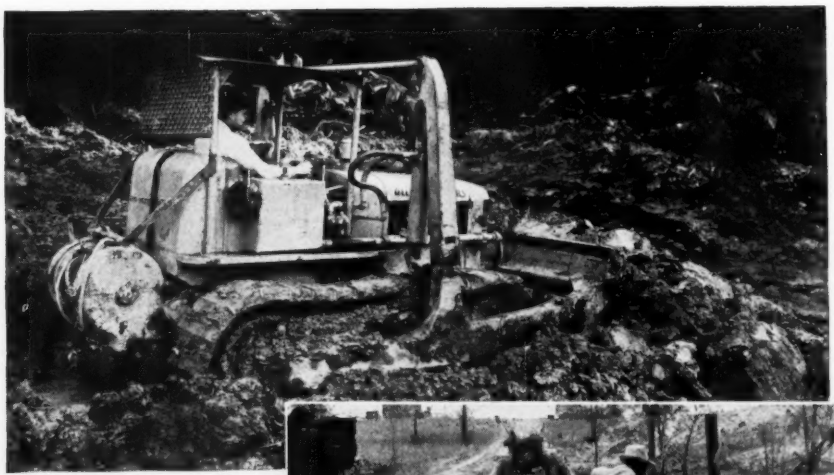
COLD WEATHER OPERATION

Courtesy of Caterpillar Tractor Co.



Courtesy of Allis-Chalmers Manufacturing Company

DIRT



OPERATING CO

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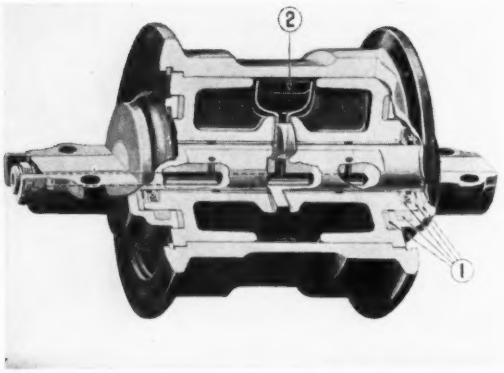
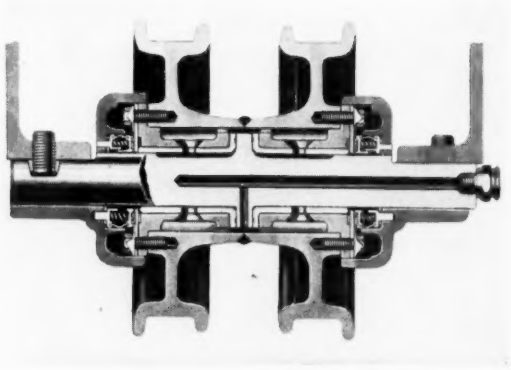


Courtesy of International Harvester Company, Inc.

Figure 5 — The International Harvester track roller.



Courtesy of Caterpillar Tractor Co.

Figure 6 — The "Caterpillar" track roller.

for cleaning dirt from the groove of the button-head fitting could be used so that the hose coupling can be quickly and easily attached. The tool also removes dirt from over the center inlet hole preventing this dirt being forced into the bearing. The oil hose connection from the bucket or other type pump should be hooked on to the track roller fitting. Lubricant should be pumped into each bearing until clean lubricant begins to show.

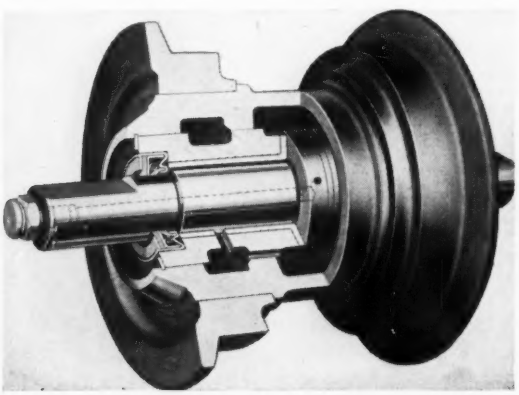
In applying lubricant, the first strokes of the gun will refill the reservoir while the following strokes push out the lubricant adjacent to the seals which has become contaminated with dirt or water. After the reservoir has been refilled, increased pressure will be required at the gun handle. If the ground conditions have not been bad, one extra stroke of the gun after the reservoir has been refilled should suffice. If the machines have been operating in mud and water or very fine sand, several extra strokes may be required before clean grease is visible at the roller shaft end or at the roller end collar. Too much pressure should not be applied to the lubricator handle or seals may be injured.

ROLLER BEARING TRACK ROLLERS

Roller bearings are used in truck wheels, idlers, and track rollers of Allis-Chalmers track-type tractors. These assemblies are provided with positive seals on either end for retention of lubricant in the bearing and exclusion of water and foreign matter.

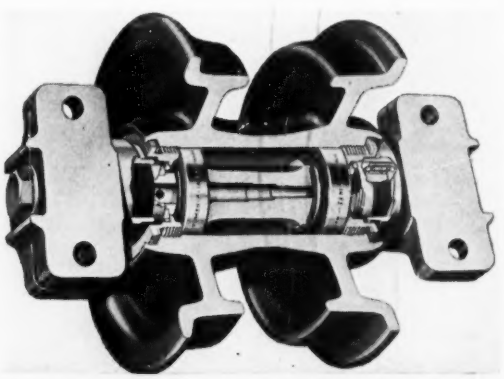
A quarter-view of a truck wheel employing roller bearings is shown in Fig. 8. Details of the assembly are illustrated, including the hollow inner shaft, the two bearings, and the seals.

Until recently, engine oil of the viscosity used in the tractor engine was recommended for lubricating the roller bearing type of truck wheels. To increase the length of time between service periods, however, these assemblies are now packed with grease at the factory. Assemblies that have been packed with grease should not be lubricated with oil later.



Courtesy of The Oliver Corporation

Figure 7 — The Oliver track wheel.



Courtesy of Allis-Chalmers Manufacturing Company

Figure 8 — The Allis-Chalmers truck wheel.

Courtesy of Caterpillar Tractor Co.

HOT WEATHER OPERATION

Courtesy of Caterpillar Tractor Co.

Rollers that are being operated in the field with oil can be converted to grease lubrication without removal from the tractor, providing they are in good mechanical condition. Operators who prefer oil may continue to use it with assemblies that originally contained oil. If oil is used, a lubrication interval of 200 hours is recommended.

Grease-packed assemblies should be relubricated at 1000-hour intervals. The type of grease recommended for these bearings was selected because of its good heat and oxidation stability, good pumpability and cold temperature characteristics, and for minimum effect on the synthetic rubber boots of the lubricant seals.

The properties of heat and oxidation stability are extremely important; it has been no small task to incorporate them in lime soap greases.

Greases most completely meeting the above requirements are calcium or lime soap base products, although some barium, aluminum or lithium soap greases might also be found satisfactory. A worked penetration range (ASTM) of 255 to 385 at 77°F. is recommended, with the viscosity of the mineral oil component specified as 120 to 185 S. U. seconds at 130°F. Fillers are undesirable as holds true for all anti-friction bearing lubrication.

Grease Packing in the Field

Before packing with grease in the field, the operator should make certain that roller assemblies are in good condition and that there is no excessive oil leakage. The assembly should be inspected for end play and looseness. To inspect the truck wheels it is necessary to take the weight of the tractor off of them. Check each truck wheel, support roller and idler separately. If end play or up and down motion is present the assembly should be removed and repaired before serious damage or complete failure occurs. *Packing an assembly with grease will not correct worn or broken parts.*

A special nozzle assembly is supplied by the tractor manufacturer for use with either a lever grease gun or volume lubricator. The procedure recommended by the manufacturer is as follows:

"Clean the nozzle tube thoroughly and attach it to the coupler. Remove the plug from the end of the assembly to be packed. Remove dust cap from the end of nozzle and insert it full depth into the shaft of the assembly to be packed and hold in that position. Pump slowly until all the old lubricant is removed and new grease can be seen coming out along the outside of the nozzle.

Caution

"Pump grease slowly and *do not* use an air powered lubrication system. Pumping the grease too fast will force open the seals and damage to the seal assemblies may result.

"Assemblies which have been packed with grease should never be lubricated later on with lubricating oil.

"Every 1000 hours of operation, relubricate the assemblies with a grease approved by the manufacturer. To repack proceed as outlined above and fill until new grease appears along the outside of the nozzle. It is recommended that the grease and grease gun be at normal room temperature of 70°F. or above when filling the assemblies, as at such temperatures the grease will flow better to all parts.

Inspection

"Every 1000 hours of operation, inspect the truck wheels, track idlers and support rollers for end play and up and down motion. To inspect the truck wheels it is necessary to take the weight of the tractor off of them. If any looseness or damage is noticed the assembly should be removed and repaired before serious damage or complete failure results."

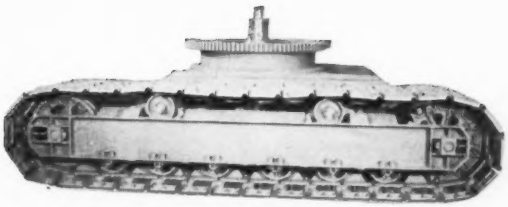
Compliance with the above instructions of the tractor manufacturer results in improved operation and reduced maintenance, the true objectives of lubrication. The quantity of grease that is required for complete lubrication of the rollers on a tractor, varying from 12 to 28½ lbs. according to the size of the tractor, is but a small factor when compared with the increased maintenance period and protection of roller mechanisms thus afforded.

SERVICING THE CRAWLER MECHANISM

As wear occurs at the track pins, bushings, rollers, idlers, and sprockets, the track becomes loose and the front idler has to be moved forward to take up the slack. For minimum wear, the track adjustment should be such that the track can be lifted with a bar 1½ to 2 inches above the upper track rollers. To make sure all the slack is in the upper portion of the track, place a 12-inch block under one of the forward track shoe lugs; put machine in low gear and engage clutch only enough so that rear sprocket tightens the track along the ground.

The track rollers, sprocket, and idler must be kept in alignment. The track frame must be aligned on the drive sprocket shaft using washers of the proper thickness so that the tracks travel true with the rollers. Shims are provided on the track front idler yoke to keep the front idler aligned properly.

Every 500 hours the nuts and bolts on the track crawler mechanism should be tightened; particularly the sprocket nuts and the bolts that hold the track roller assemblies to the track frame.



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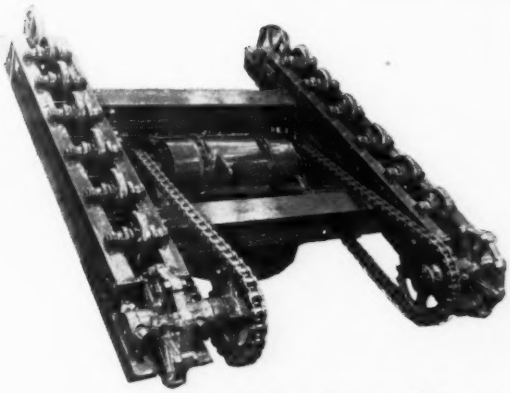

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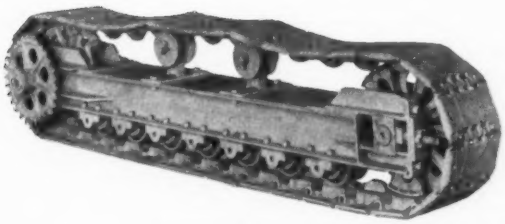

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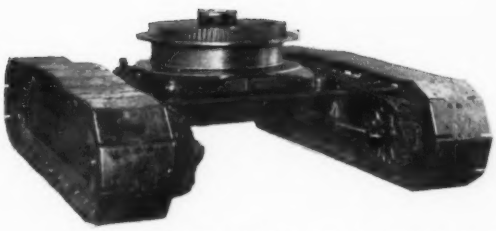

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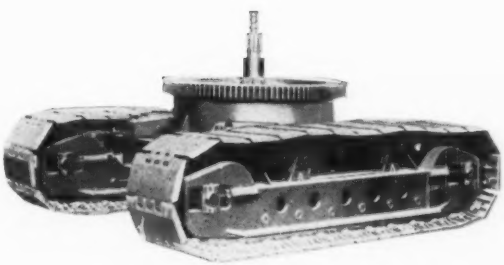

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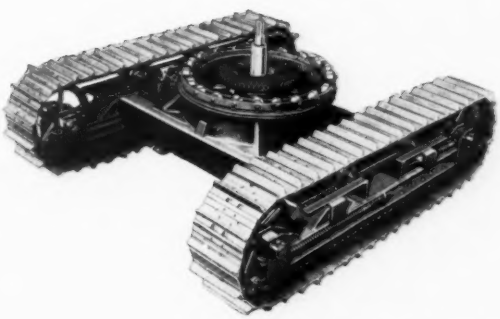

Courtesy of Harnischfeger Corporation

TYPICAL CRAWLER TRACK ASSEMBLIES

When installing a track roller on its shaft, be careful not to damage the seals.

While the track roller is a simple rugged mechanism, it is probably more subject to wear than any other lubricated part on construction machinery and, therefore, must be given a certain amount of care. Most cases of undue wear are due to failure to apply the right lubricant at the right time.

Signs of Difficulty

1. Rapid wear of one flange of roller—usually due to misalignment of idler or sprocket with rollers — realign.
2. Roller runs hot — usually due to misalignment or lack of lubricant — may have been missed at last lubrication period.
3. Excessive amount of lubricant required — if roller is not running hot, this is usually due to defective seals — replace.
4. Roller does not revolve in service — usually due to insufficient end or shaft clearance — check.
5. Roller flanges cutting into crawler frames — usually due to worn thrust washers — replace.
6. Track tends to climb sprocket — indicates track too loose — adjust tension.
7. Oil leaking at sprocket shaft nut — usually indicates loose sprocket — tighten sprocket bearing adjusting nut.

CONCLUSION

To understand the theory of lubrication and to appreciate those factors which determine the relative lubricating value of any lubricant is commendable; to be able to put this knowledge into practice signifies that the machine requirements are quite as fully understood. Today, the operator of contracting machinery has such an understanding; he has graduated from the status of a lever-pusher, appreciative of the financial responsibility imposed upon him. His success is measured by yardage of materials handled, by ability to meet contract dates, and by the cost of up-keep or maintenance of his equipment.

This latter is definitely associated with the theory of lubrication; the more effectively it is put into practice, the better the protection of the working elements. In applying any theory, however, one must consider the practical requirements — in the contracting field, the operating conditions. In other words, certain grades of lubricants should function satisfactorily on certain mechanisms. The operator knows, however, that this premise is based on laboratory procedure, or controlled testing. Subjected to the rains of the Ohio or Mississippi Valleys, the sleet of the Lakes Region, or the dust of the wheat belt, such lubricants might tell an entirely different story.

So the operator should not be content with lubricants capable of functioning satisfactorily on more protected machinery. He must take into account the exposed nature of his shovels, draglines, bulldozers, etc., and the extent to which the construction of their moving parts may be conducive to contamination of the lubricants. Water is especially detrimental. Wherever it is present in any appreciable amount it will tend to wash off certain types of lubricating films, if these latter have not been formed by lubricants especially refined and prepared to resist this washing action. Special track roll lubricants now available give the protection which is so necessary.

The right track roller lubricant keeps rollers rolling; Keeps crawlers crawling; Keeps shovels shoveling; Keeps earth movers moving; Keeps contractors contracting.

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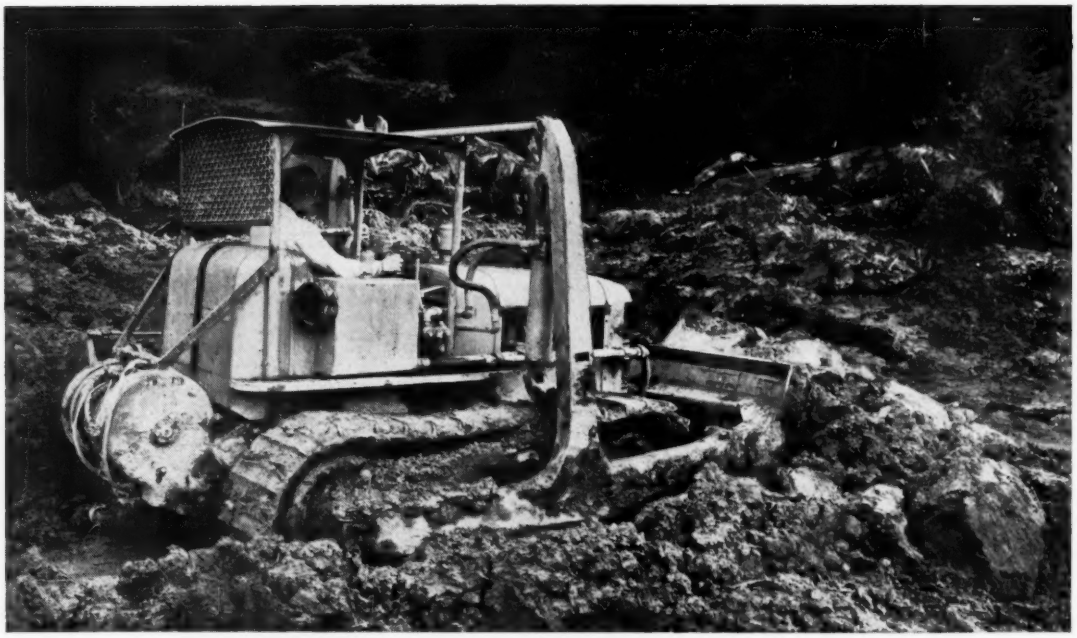

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NEW ORLEANS 6, LA., 919 St. Charles Street
NEW YORK 17, N. Y. . 205 East 42nd Street
NORFOLK 1, VA. . Olney Rd. & Granby St.
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